

BACKGROUND OF THE INVENTION

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filed on 09/27/2001, now patent no. 6,741,496 VN*

1. FIELD OF INVENTION

[0001] This invention relates generally to magnetic-polarization control and more specifically to magnetic memory systems enhanced through the control of spin-polarized electrons.

2. ART BACKGROUND

[0002] Present transistor-capacitor based metal oxide semiconductor (MOS) and complimentary metal oxide semiconductor (CMOS) non-volatile memory technologies are approaching practical memory density limits as the lithography and material processes have been scaled down to smaller geometries. The oxide thickness of flash memory cells cannot be made much thinner with existing materials without allowing the undesirable condition of hot electron tunneling to occur. Thus, a practical memory density limit is approaching for traditional transistor based non-volatile memory devices.

[0003] Electron spin based devices are being used as memory cells for the storage of data. For example, magnetic random access memory (MRAM) offers the possibility of replacing flash memory technology with a lower voltage, scalable technology. The spins of electrons are tied to magnetism, as in the ensemble of spins in a memory cell or quantum well device.

[0004] Presently constructed MRAM uses giant magneto-resistance (GMR) or magnetic tunnel junctions (MTJ) to control the sense/tunneling currents. These devices manipulate the magnetic state of the memory cell by using the coupling of strong magnetic fields induced by currents in conductors